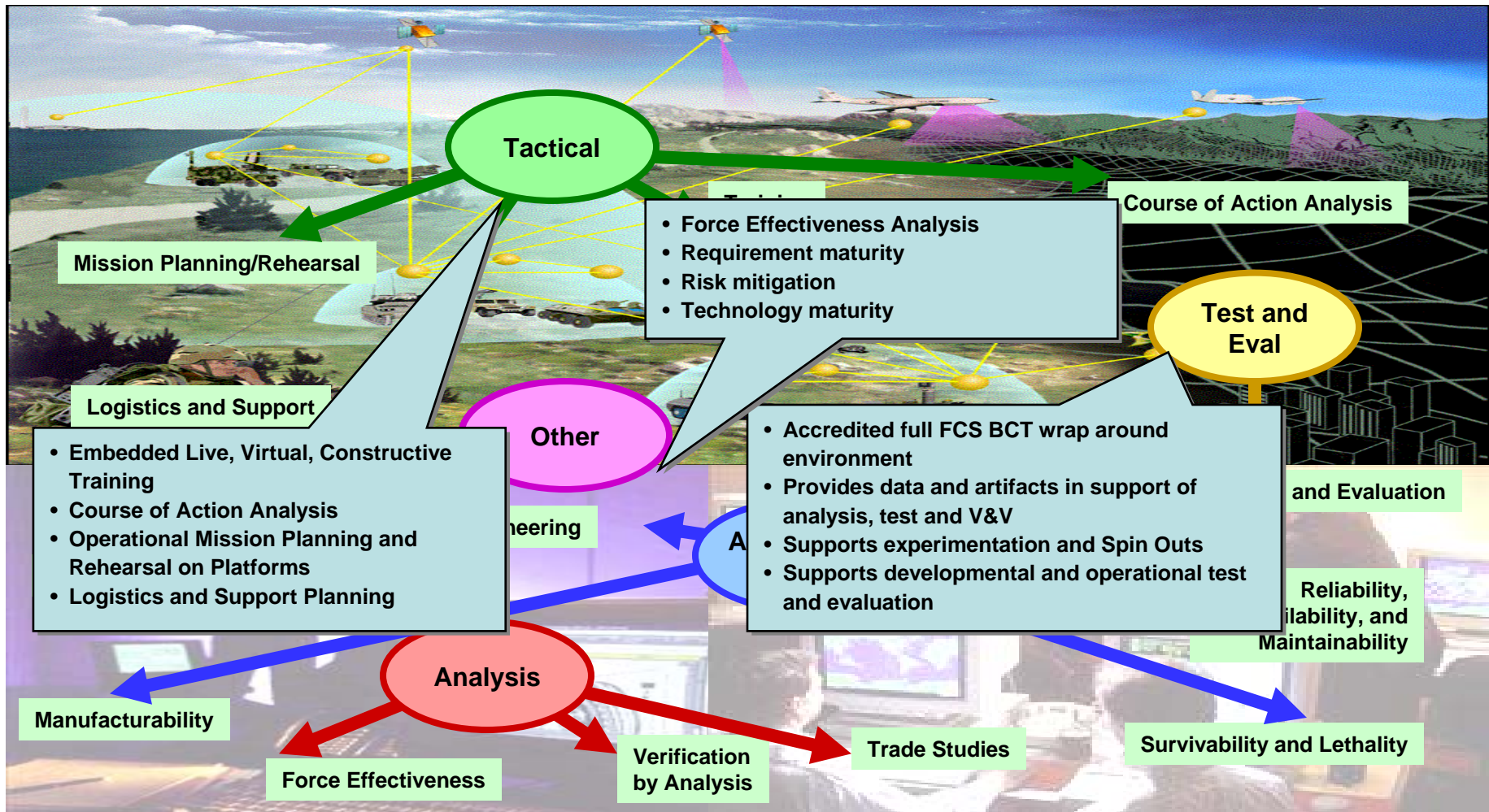# Future Combat Systems Use of M&S for T&E

DoD Modeling and Simulation Conference
Acquisition and T&E M&S Practitioners Panel
Phil Zimmerman, FCS M&S, and Analysis
13 Mar 08

		Form Approved *OMB No. 0704-0188*

Report Documentation Page

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M&S Overview

FUTURE COMBAT SYSTEMS
FCS
One Team-The Army/Defense/Industry

Tactical

Course of Action Analysis

Mission Planning/Rehearsal

- **Force Effectiveness Analysis**
- **Requirement maturity**
- **Risk mitigation**
- **Technology maturity**

Test and Eval

Logistics and Support

Other

- **Embedded Live, Virtual, Constructive Training**
- **Course of Action Analysis**
- **Operational Mission Planning and Rehearsal on Platforms**
- **Logistics and Support Planning**

- **Accredited full FCS BCT wrap around environment**
- **Provides data and artifacts in support of analysis, test and V&V**
- **Supports experimentation and Spin Outs**
- **Supports developmental and operational test and evaluation**

and Evaluation

Reliability, ilability, and Maintainability

Analysis

Manufacturability

Force Effectiveness

Verification by Analysis

Trade Studies

Survivability and Lethality

M&S is a key program enabler for all aspects of the program

Modeling and Simulation Implementation Strategy
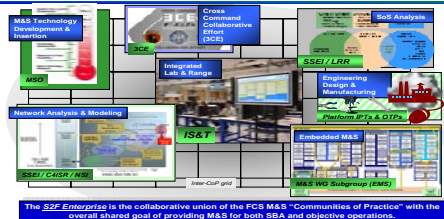
FUTURE COMBAT SYSTEMS
FCS
One Team-The Army/Defense/Industry

M&S Enterprise Management-

M&S Technology Development & Insertion

Cross Command Collaborative Effort (3CE)

SoS Analysis

3CE

Integrated Lab & Range

SSEI / LRR

Engineering Design & Manufacturing

Platform IPTs & OTPs

mSO

Network Analysis & Modeling

IS&T

SSEI / C4ISR / NSI

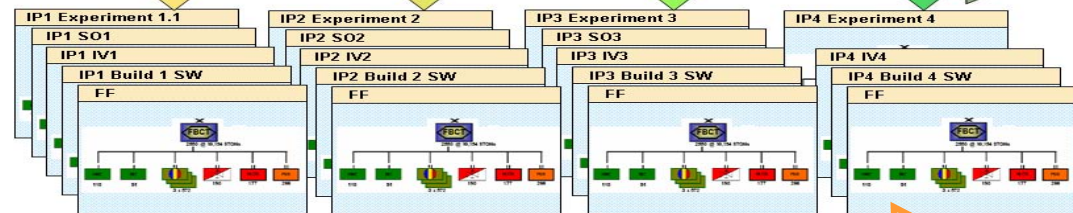Inter-CoP grid

Embedded M&S

M&S WG Subgroup (EMS)

The *S2F Enterprise* is the collaborative union of the FCS M&S "Communities of Practice" with the overall shared goal of providing M&S for both SBA and objective operations.
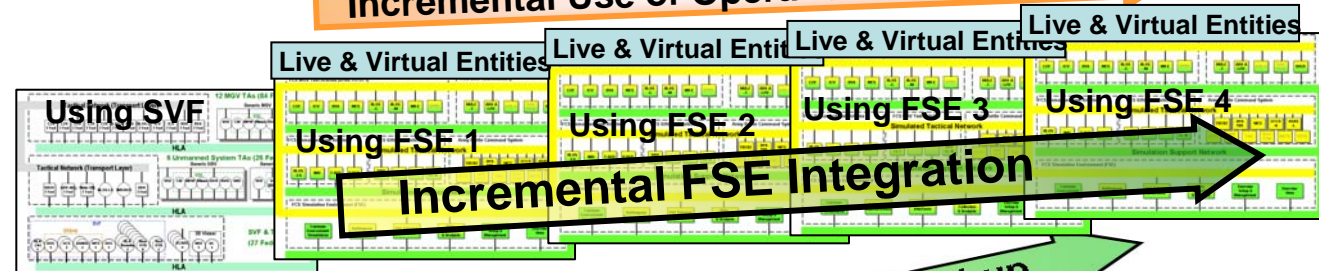
Integration Phases

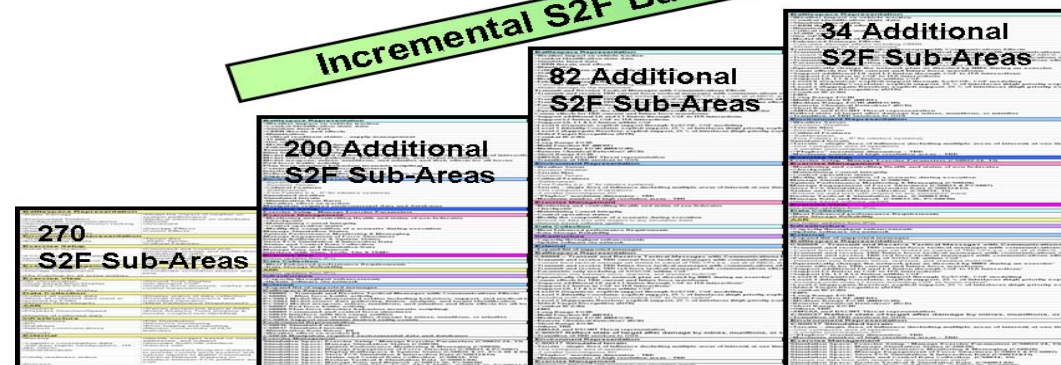| IP0 Configuration	IP1 Configuration	IP2 Configuration	IP3 Configuration	IP4 Configuration
IV0	Exp. 1.1 SO1 IV1 Build 1 SW FF	Exp. 2 SO2 IV2 Build 2 SW FF	Exp. 3 SO3 IV3 Build 3 SW FF	Exp. 4 IV4 Build 4 SW FF

- Phased Functional Allocation
- Incremental SoS Functional Capabilities

IP1 Experiment 1.1
IP1 SO1
IP1 IV1
IP1 Build 1 SW
FF

IP2 Experiment 2
IP2 SO2
IP2 IV2
IP2 Build 2 SW
FF

IP3 Experiment 3
IP3 SO3
IP3 IV3
IP3 Build 3 SW
FF

IP4 Experiment 4
IP4 IV4
IP4 Build 4 SW
FF

S2F Library

M&S Products

Operational SW & HW

Models and Simulations

Tools

Acquisition Support — such as Cost, Design, Engineering, Human Factors

ISR C4I/network Comm | Survivability Lethality Mobility Flight

C4ISR Models | System Behavior

Surrogates

Reconfigurable Desktop Sim | High Fidelity System Simulators/Sims | Joint

Entity Based (e.g. OTB, OOS, JANUS, etc) | Non-Entity Based (e.g. VIC, AWARS, etc) | Joint

Extant or Emerging "Federations" — such as SVF BLCSE FSE DTE

Environment OPS Plan BLUFOR OPFOR Coalition/Neutral

Battlespace Environment

Execution Environments — Laboratories, Engineering & Development Centers, Analysis Centers, Test Ranges & Facilities, Training Ranges & Facilities, Fielded Platforms

M&S Protocols HLA

Integration and Test Configurations from S2F Toolset repository

Incremental Use of Operational SW & HW

Using SVF

Live & Virtual Entities — Using FSE 1
Live & Virtual Entities — Using FSE 2
Live & Virtual Entities — Using FSE 3
Live & Virtual Entities — Using FSE 4

Incremental FSE Integration

Incremental S2F Build-up

270 S2F Sub-Areas

200 Additional S2F Sub-Areas

82 Additional S2F Sub-Areas

34 Additional S2F Sub-Areas

S2F Enterprise Management and Product Development

FUTURE COMBAT SYSTEMS
FCS
One Team-The Army/Defense/Industry
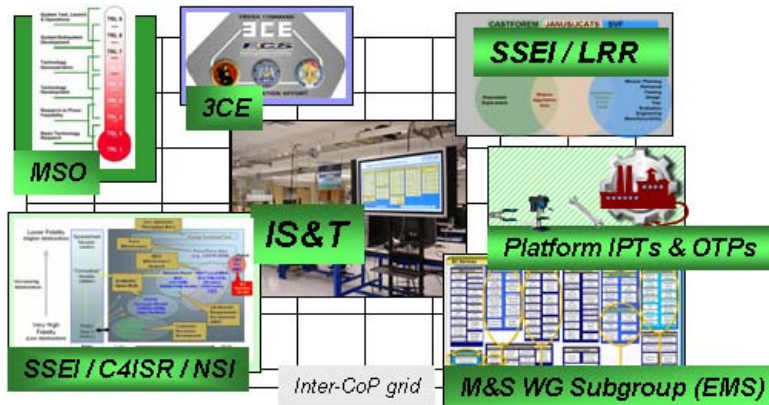
M&S Technology and Development Insertion

Cross Command Collaborative Effort (3CE)

SoS Analysis

Network Analysis and Modeling
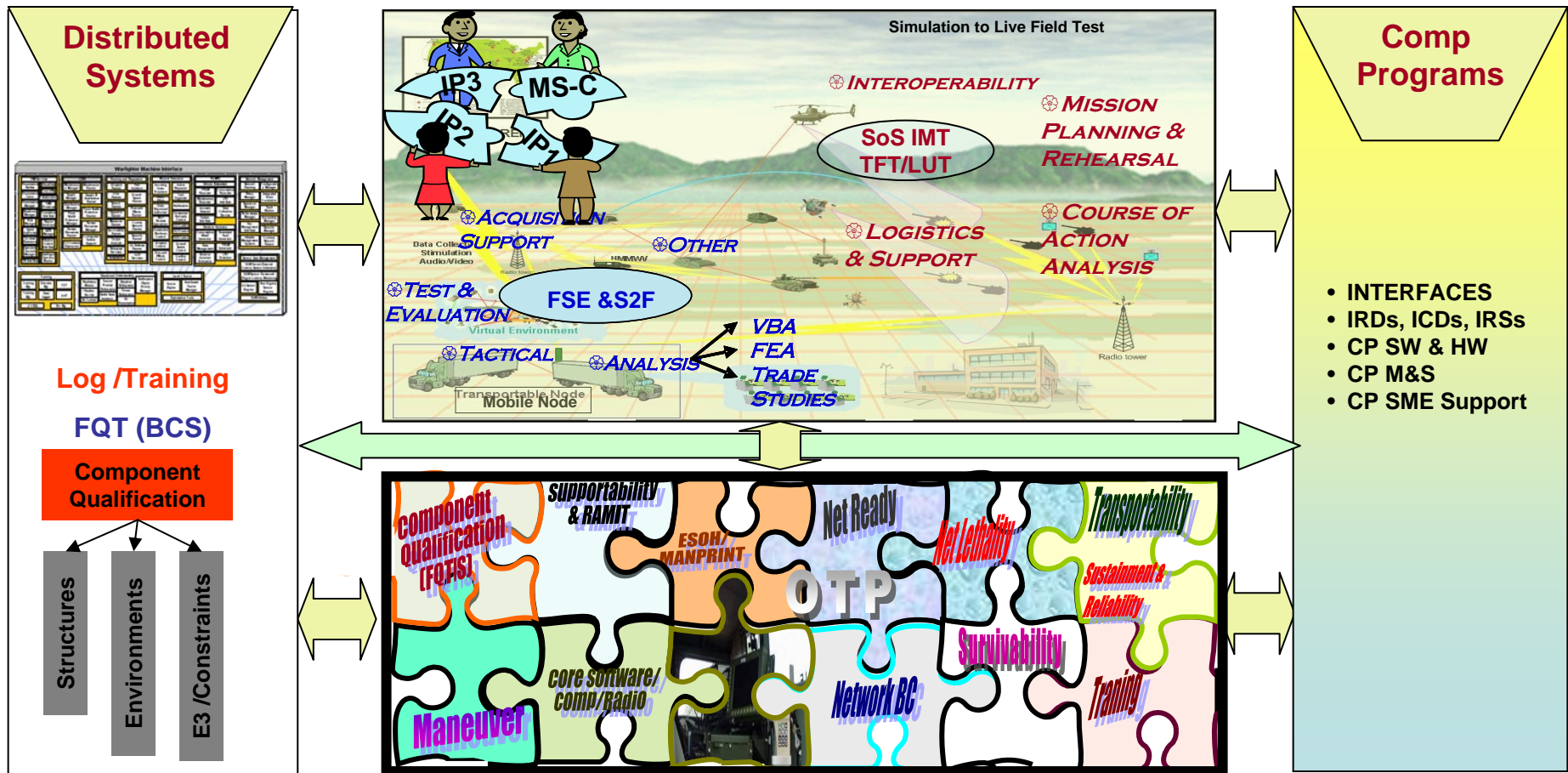
T&E - Integrated Lab and Range

Engineering Design and Manufacturing

Embedded M&S

The S2F Enterprise is the collaborative union of the FCS M&S "Communities of Practice" with the overall shared goal of providing M&S for both SBA and objective operations

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✓ **S2F M&S Requirements Flowed down**
✓ **Established a Community of Practice**
↗ **M&S technology Insertion in Critical Technology Demos**
↗ **M&S Product alignment to CPM to support IP events**

✓ **Successful Integration Events 1-6 for SO1 Testing**
✓ **M&S Requirements alignment for DT/OT, FDT&E, Training**
✓ **S2F and FSE component utilization in SO1 TFT, LUT**

✓ **Constructive M&S Use in Ongoing FEA, Trade Studies per SoSAP and INAP**
✓ **Ongoing V&V of M&S for Test/Demonstration (Exp 1.1, IMT1)**
↗ **IMT1 Assessment Data Supports Incremental VbA**

✓ **Development/Execution of OnePlan for ETE Network Modeling**
↗ **Utilization of FSE/CES for IMT1, CT Demos. Baseline Analysis, BCSS Trade Studies, Exp 2.2 Lab AOs (DFM, RBD)**
↗ **CES 4.0 - FCS Network Transport Sim Configured w/ FCS Baseline Design (i.e. WLS, Spectrum allocation, etc.)**
↗ **CES 5 and CES 6 with NMS and dynamic Config. of FCS Network.**

✓ **Successful use of M&S to complete Exp. 1.1**
✓ **Completed M&S EI (Delta RAP)**
✓ **S2F Requirements Baselined in DOORS**
↗ **Successful Conduct of SoSIL CDR for IMT1 – Road to WSMR**
↗ **Successful conduct of M&S V&VA in IMT2**
↗ **Execution of Distributed M&S and Testing Capabilities for IP2+**

↗ **OTP use Engineering M&S to Support System in Design SIL**
↗ **M&S V&V as part of OTP PDR and CDR (UGS)**

✓ **M&S Requirements Definition and Phased Allocation for Embedded M&S (TCC PIDS, CPM)**

Integrated SoS M&S and Test Overview

FUTURE COMBAT SYSTEMS
FCS
One Team-The Army/Defense/Industry

Distributed Systems

Comp Programs

Simulation to Live Field Test

IP3   MS-C
IP2   IP1

⊛ INTEROPERABILITY
⊛ MISSION PLANNING & REHEARSAL

SoS IMT TFT/LUT

⊛ ACQUISITION SUPPORT
⊛ OTHER
⊛ LOGISTICS & SUPPORT
⊛ COURSE OF ACTION ANALYSIS

Data Collection Stimulation Audio/Video

⊛ TEST & EVALUATION
FSE & S2F
HMMWV

Virtual Environment

⊛ TACTICAL   ⊛ ANALYSIS
VBA
FEA
TRADE STUDIES

Transportable Node
Mobile Node
Radio tower

Log /Training

FQT (BCS)

Component Qualification

- Structures
- Environments
- E3 /Constraints

Component qualification (FOT&S)
Supportability & RAMIT
ESOH/ MANPRINT
Net Ready
Net Lethality
Transportability
Sustainment & Reliability
OTP
Survivability
core software/ comp/Radio
Network BC
Maneuver
Training

- **INTERFACES**
- **IRDs, ICDs, IRSs**
- **CP SW & HW**
- **CP M&S**
- **CP SME Support**

M&S and test activities contribute requisite verification and validation data to successfully demo FCS BCT capability

Summary

- FCS M&S is driven by both the program requirements (the "what"), and the user's needs (the "how much")

- Test is one of the users
  - Shares the same program requirements sets
  - Needs are both as a program tester, and a gov't tester
  - M&S solutions may or may not be different

- Test shares the available M&S assets, and contributes to the asset set (S2F)